DOCUMENT RESUME

ED 233 718 IR 050 309

TITLE	Study of the Communications Needs of the Fox Valley Interlibrary Loan Network. Final Report.
INSTITUTION	Metrics Research Corp., Atlanta, GA.
SPONS AGENCY	Sheboygan County Federated Library System, WI.
PUB DATE	Jun 82
NOTE	20p.
PUB TYPE	Reports - Evaluative/Feasibility (142)
EDRS PRICE	MF01/PC01 Plus Postage.
DESCRIPTORS	*Computer Oriented Programs; *Cost Effectiveness; Design Requirements; Feasibility Studies; Information Needs; *Interlibrary Loans; *Library Automation; *Library Networks; Library Surveys; Microcomputers; *Telecommunications
IDENTIFIERS	Wisconsin

ABSTRACT

A study of the libraries cooperating in the Fox Valley (Wisconsin) Interlibrary Loan Network compared alternative equipment and communications scenarios which would satisfy the functions desired by the libraries. The dominant communications need identified through a survey of network participants was the sending of interlibrary loan requests among network members and between network members and other resource libraries. The study considered four major options for equipment (TWX terminals, microprocessor terminals, microcomputers, and microcomputers with central clearinghouse node) and seven different transmission possibilities (TWX direct or via computer, State Telephone System or Direct Distance Dialing at either 300 Baud or 1200 Baud data transfer rates, or Telepak, the existing system) as possible solutions to satisfy the Network's communications needs. Results indicate that microcomputer nodes with communications software could provide added functions at a cost comparable to the cost for the currently used technology. Two appendices provide results of the informal survey of library needs and the notes on system selection. (LMM)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
☒ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

ED233718

STUDY OF THE COMMUNICATIONS NEEDS

of the

FOX VALLEY INTERLIBRARY LOAN NETWORK

final report

prepared for

Sheboygan County Federated Library System

710 Plaza 8

Sheboygan, Wisconsin 53081

by

Metrics Research Corporation
180 Allen Road, Suite 200 South
Atlanta, GA 30328

(404) 255-1976

June 1982

IR050309

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
Robert M. Mason
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

CONTENTS

Introduction 1

Communications Requirements 2

System Options 4

Evaluation 7

Conclusions and Recommendations 11

Appendix A. Results of Informal Survey 13

Appendix B. Notes on System Selection 14

INTRODUCTION

Purpose

This report summarizes the results of a study of the telecommunications needs of the Fox Valley Interlibrary Loan Network (hereafter called the Network). The report is intended to provide the basis for the Network to make an informed decision about acquiring new communications equipment and services for the Network.

Scope

The study included the identification of the current needs of the Network, a discussion of these needs with representatives from the Network, and the identification and evaluation of the alternative approaches to meeting these needs. The study included six person-days of effort and two trips to meet with Network representatives. The results outline the range of alternative approaches and the estimated cost of each.

Approach

The initial RFP for the study outlined the communications approaches currently being used by the Network and indicated the desired characteristics of a more modern system. Early in the study, the consultant met with representatives from the Network and others from Wisconsin interested in the study and its results.

The participants discussed the desired system and equipment characteristics in more detail (from both the Network members' and other participants' viewpoints), outlined the anticipated budget, and discussed the current capabilities and trends in microcomputer and telecommunications technology. A summary list of desired functions and characteristics provided a basis for obtaining information on the relative importance of these functions from Network members.

The consultant identified alternative scenarios which would satisfy different desired functions and remain within the tentative budget constraint identified. These alternative scenarios were compared on the basis of costs using estimates of communications requirements provided by the Network. Based on this comparison of current costs and the anticipated trends, the consultant presented the conclusions and recommendations in a preliminary final report.

The final meeting of the consultant with Network representatives reviewed the recommendations, discussed the significance of the findings, and outlined further actions. This final report reflects these discussions and completes the study.

COMMUNICATIONS REQUIREMENTS

The dominant communications need of the Network is the sending of interlibrary loan requests among Network members and between Network members and other major resource libraries (R & L and WILS particularly). The relative desirability of different system capabilities are summarized below. Appendix A presents a summary of the results of the informal survey taken of the Network members.

The system functions judged by the members to be required include:

- offline editing,
- minor editing (not retyping) to send a request that is unfilled within the Network on to another library,
- ease of repair and maintenance for the equipment,
- hard copy output.

System functions judged to be required by half or fewer of the network members but desirable by the others include:

- compatibility with TWX,
- electronic mail,
- flexibility for different procedures within different libraries, and
- automatic production of overdue notices and reminders.

Other functions judged by the Network members to be desirable (or nice to have) include flexibility of using the equipment for applications other than ILL, compatibility with OCLC and other data bases, and automatic (or assistance with) balancing of lending and borrowing among the Network members.

The current procedure, using the DataPak leased line and TWP equipment, is for a requesting library to type the request online and send it simultaneously to the five other Network libraries. Each of the other libraries then sends either a response or acknowledgement to the requesting library. Requests not filled within the Network are retyped and sent to RLL, which responds or acknowledges the request.

A "round robin" request procedure would reduce the number of responses required. If each request were directed to a particular library with a second, third, fourth, and fifth choice library in the original request, each library could respond with either a negative response (thus passing the request on to the

next choice) or an acknowledgement that it is fulfilling the request.

Table 1 gives the estimates of message traffic for both the current procedure and the round robin procedure. The figures are based on estimates from Network members. (Different accounting procedures make it virtually impossible to have consistent data, but the estimates are believed to be sound.) For the round robin procedure, the assumption is made that a request will be transmitted to an average of 2.5 libraries before being fulfilled. Consequently, the number of intra-Network messages is reduced by half. The number of requests and responses to the RLL would be the same for both procedures.

An average request is assumed to consist of 300 characters. An average response is assumed to contain 50 characters.

Table 1. Message Transmissions

(annual number of messages)

	Current Procedure	Round Robin
Within Network		
Requests	100,000	50,000
Responses	500,000	50,000
External		
Requests	15,000	15,000
Responses	15,000	15,000

Message length assumptions:

Requests--300 characters each
Responses--50 characters each

SYSTEM OPTIONS

Four major options for equipment and seven different transmission possibilities were identified as potential solutions to satisfying the Network's communications needs. The applicable combinations are summarized in Table 2. The paragraphs below describe the equipment scenarios, the possible transmission links that can be associated with them, and the relative advantages and disadvantages of each.

Table 2. Possible Equipment-Transmission Link Combinations

	Node Equipment			
	TWX Terminals	Microprocessor Terminals	Micro-computers	Micros + Central Node
TWX-Direct	X	X	*	*
TWX-via Computer	X	X	*	*
STS @ 300 baud	NA	X	X	X
STS @ 1200 baud	NA	X	X	X
DDD @ 300 baud	NA	X	X	X
DDD @ 1200 baud	NA	X	X	X
Telepak (current)	NA	**	**	**

Notes: X indicates possible combination

* possible with extra microprocessor-based equipment or software

** possible, not judged to be economically desirable

STS = State Telephone System

DDD = Direct Distance Dialing

baud = bits/second (data transfer rate)

1. **TWX Network**

This scenario postulates that each of the Network member libraries acquires a TWX machine. The terminal can be a standard teletype device or one that allows off-line message preparation and editing prior to communications. With a TWX terminal, the user pays a monthly charge (around $34) for access to the TWX network plus a charge for the time required to transmit each message. This "message charge" is lower if the message is transmitted to a central TWX computer for later transmission to the addressee. Multiple addresses for a single message are possible, and lists of addressees can be set up for frequent communication. The charge for sending the message to five addressees is five times the charge for sending the message to one addressee.

Advantages: ability to communicate with WILS, RLL, UWi, others who have TWX capability

probably lowest initial cost of all options (for basic terminal; off-line editing capability costs more)

cost can be proportional to number of messages

Disadvantages: limited to TWX use, little or no other usage

2. **Microprocessor Communications Terminals**

This scenario is similar to Scenario 1 except that each Network member has a microprocessor-based communications terminal that permits off-line editing of messages and transmission control. Hard copy terminals (similar to teletype terminals) or CRT-based terminals with low cost printers are optional configurations. Terminals are available with TWX and/or Telex capability and built-in 300 baud or 1200 baud modems that permit node-to-node direct dial links (including STS for the Wisconsin situation).

Advantages: includes those of TWX network

permits direct distance dialing (DDD) or state telephone system (STS) links within Network, so communications costs can be lower than all-TWX network

Disadvantages: higher investment cost than TWX network

limited storage of requests (estimated 45)

apparent limitation on different formats

no longer-term message storage (for sending on to RLL if unfilled within Network)

3. Microcomputer Network

In this scenario, each of the Network member libraries acquires a microcomputer, each with originate/answer modem, communications protocol software, and other software as desired. With appropriate software (available for some computers) or microprocessor-based equipment described in Scenario 2, each node can be compatible with TWX locations.

Advantages:

- flexibility in applications and use--as additional applications are desired, software is purchased or developed
- immediate capability for off-line message preparation and editing
- expansion possible--other libraries can access any of the resource libraries if desired
- most control over communications cost--probably lowest communications cost

Disadvantages:

- higher initial investment than TWX only or microprocessor-based terminals
- greater skill, specialized knowledge required
- extra cost for TWX compatibility

4. Microcomputer Network with Central Clearinghouse Node

This scenario is an expansion of the previous one. Each resource library has a microcomputer or intelligent terminal, and one library has a micro- or minicomputer that has additional storage and processing capabilities. This central node serves as a clearinghouse for electronic mail and all requests.

Advantages:

- electronic mail capability
- potential for keeping statistical records and adding automatic network balancing capability and automatic request forwarding capability (including TWX)

Disadvantages:

- initial cost is higher
- communication cost probably higher than any scenario except for one in which each node has only TWX capability
- loss of central clearinghouse node means that the network is "out of service" if it is dependent on the central node for essential functions.

EVALUATION

Required Functional Capabilities

The TWX scenario with editing terminal has the potential for meeting all the required functional capabilities for the communications system, assuming messages can be stored in the TWX computer for later recall and retransmission. The microcomputer network scenario and the microcomputer network with central node also fulfill the required functions. The microprocessor communications terminal option meets the required capabilities only for a limited number of non-TWX messages (storage is limited). The Telepak leased line with TWP equipment (or other terminal equipment with no memory) does not meet the required functional capabilities.

Economic Analysis and Comparison

Table 3 presents the estimated capital cost (and monthly lease amount, if applicable) for each of the scenarios. The amounts presented are for each Network member and are based on the following assumptions:

- Maintenance is 15% of hardware costs annually.
- Annual cost is calculated by dividing the hardware and software total amounts by 10 (assuming a ten year useful economic life) and adding the annual maintenance costs. (Note that although the economic life of the hardware can be even greater than ten years, the technology is changing rapidly and the purchased equipment can be technically obsolete much sooner.)
- The basic equipment consists of an eight-bit microcomputer that has at least 64 Kilobytes of internal memory, dual floppy disk drives, a modem, and a printer. Depending on the features of the microcomputer (see Appendix B), the costs shown will include a full character letter quality printer or a dot matrix (higher speed, lower quality print) printer. The standard software includes a text editor/word processor, communications utilities, a higher order language such as BASIC, and a spread-sheet type program for budgeting and arithmetic tasks. The custom software includes utilities for message formatting and handling and for communications.

For scenario 4 (microcomputer with additional central node), the estimated additional hardware and software costs are divided among the six members. (Costs for scenarios 3 and 4 are estimates. They are judged to be reasonable, possibly too high. Actual costs would be determined by vendor bids.) A fifth

option, falling between scenario 2 and 3, is that of the TI Terminal-Teledisk-Modem. With additional software, it could satisfy the required functions. However, at a cost of approximately $5000, it is almost as much as a general purpose microcomputer without its flexibility. Note that Scenario 4 exceeds the $10,000 initial limit on investment per library.

Table 4 presents the costs for each of the communications options. Table 5 summarizes the overall annual costs for the major hardware-communications options. Instead of showing the costs of Scenario 4, which exceed the investment limit, Scenario 3 with the TWX option is shown. DDD combinations are not shown since the STS costs are always lower.

Table 3. Costs of Terminal Equipment

	Scenario 1	2	3	4
Initial Costs				
Basic Hardware	1600	2800	6000	8000
Software (standard)	NA	NA	1000	1000
Software (custom)	NA	NA	1200	1600
Installation	100	100	200	200
Annual Maintenance	240	420	900	1200
Total Annualized Cost	410	710	1740	2240
Monthly Lease	89	110	NA	NA
Add for				
TWX capability	NA	0	1500	1500
1200 baud capability	NA	1100	500	500

Note: NA = not applicable. See text for assumptions.

Table 4. Communication Link Costs

	Cost/minute
TWX Monthly charges $34.00	
TWX (day, direct)	$ .43
TWX (day, via computer)	.12
STS (from Network member to Madison)	.06
STS (member to member via Madison)	.13
DDD (Direct Distance Dial) (typical, first minute)	.45
DDD (additional minutes)	.30
Telepak leased line (estimated 1983 annual charges)	$13550

Notes: TWX rates from Western Union
STS (State Telephone System) and Telepak rates from Royce Williams, STS
Typical DDD rate was assumed for calculations

TABLE 5. SUMMARY COST ANALYSIS

Scenario	1 (TWX)		2		3		3 with TWX		current
Baud Rate	110	110	300	1200	300	1200	300	1200	1200
Annualized Initial Cost	410	410	710	985	1740	1865	2115	2240	NA
Marginal Costs									
(current procedures)	direct	via computer				via STS			
Network messages (requests)	19545.45	5454.55	2166.67	541.67	2166.67	541.67	2166.67	541.67	NA
Network responses	16287.88	4545.45	1805.56	451.39	1805.56	451.39	1805.56	451.39	NA
External requests	2931.82	818.18	150.00	37.50	150.00	37.50	2931.82	818.18	NA
External responses	488.64	136.36	25.00	6.25	25.00	6.25	488.64	136.36	NA
(round robin)									
Network requests sent	9772.73	2727.27	1083.33	270.83	1083.33	270.83	1083.33	270.83	NA
Network responses	1628.79	454.55	180.56	45.14	180.56	45.14	180.56	45.14	NA
TWX monthly charges	2448	2448	2448	2448	NA	NA	2448	2448	NA
Total Communications Costs per Year									
current procedures	41702	13403	6595	3485	4147	1037	9841	4396	13550
round robin	17270	6584	3887	2808	1439	360	7132	3719	13550
Total Costs per Year									
current procedures	44162	15863	10855	9395	14587	12227	22531	17836	13550
round robin	19730	9044	8147	8718	11879	11550	19822	17159	13550
Communications Cost per request*									
w/n Network, current proc.	1.79	.50	.20	.05	.20	.05	.20	.05	NA
w/n Network, round robin	.57	.16	.06	.02	.06	.02	.06	.02	NA
External	.23	.06	.01	.003	.01	.003	.23	.06	NA
Total Cost/request									
current procedures	1.26	.69	.52	.47	.73	.61	1.12	.78	.67
round robin	.56	.39	.39	.43	.59	.57	.99	.75	.67

All costs in dollars ($); NA = not applicable

*total 35,000: 20,000 within the Network plus 15,000 external

CONCLUSIONS AND RECOMMENDATIONS

The Network's communications costs can be substantially lowered by an investment in terminal equipment and software. The new capabilities also can provide the desired additional functions of off-line editing, forwarding of messages with only minor editing, and other applications that will permit more efficient use of staff time in the Network libraries. Scenarios 1 and 2 at their base level (lowest investment) do not provide the desired functions, but Scenario 3 does. Hardware for Scenario 3 is readily available, but some custom software is required.

The recommended approach is to implement Scenario 3 with the 1200 baud capability and use the STS for the communications link. This approach is recommended for the following reasons:

- A general purpose micro-based system provides the greatest flexibility of applications and procedures, thus avoiding accelerated technical and economic obsolescence of more specialized equipment;
- Scenario 4 could be implemented for a relatively low cost at a later time, providing additional desired capabilities without discarding or replacing the equipment purchased now; and
- The difference in cost of a 1200 baud modem over a 300 baud modem is economically justified with the current message levels and STS rates and is judged to be a reasonable hedge against increasing telecommunications rates.

The recommended procedure is to prepare explicit requirements for the desired system and issue these in an RFP to obtain the best combination of hardware, software, price, and vendor experience.

Proceeding immediately with procurement would mean working out formats and procedures later, and this is not recommended. Instead, the following steps are suggested:

1. Agree on the format and procedures to follow in making requests and responding to requests. (This will permit more explicit software specifications--thus reducing costs, simplifying the procedures for installation, reducing training time, and reducing staff time after implementation.) Decide how the equipment will be supported (how much internal support will be feasible).
2. Prepare the software, hardware, and support specifications in as much detail as feasible.
3. Decide how potential vendors will be evaluated.

4. Issue a request for proposals (RFP) that includes the evaluation procedures and criteria and the system specifications. The RFP should include as much detail as feasible on the desired hardware features and performance, software functions, and overall system functional requirements. The RFP should describe how the system will be utilized, how the suppliers will be evaluated, an upper limit on budget for the installations, and what level of after-sale support is expected.

   The RFP should be sent to local computer stores, the major equipment/system manufacturers (Tandy Radio Shack, Apple, Cromemco, etc.), and system integrators (individuals or firms that provide turnkey systems by assembling a collection of components, possibly from different manufacturers, to meet particular specifications). The system that represents the best value to the Network and meets the fiscal constraints should be chosen for installation.

The additional time required to follow this procedure will be a valuable investment. The resulting consensus on operating procedures and expectations for the equipment and software will reduce the problems associated with the purchase and initial operation of the new system. Appendix B outlines additional detail on the considerations for developing the specifications and expectations for the system.

The capability of parallel operation (the option of using the existing TWP/Telepak system) should be preserved for up to three months after the installation of the new system. Such operation may be unnecessary, but it is better to have the capability, even if it is not used.

APPENDIX A

DESIRED FUNCTIONS OF COMMUNICATIONS NETWORK

Fox Valley (WI) ILL Network

results of informal survey of Network members

No. of responses: R (required), D (desired), and N (nice to have)

4/1/0___Messaging
Library to library (one-to-one)
Library to libraries
Responses from each library

2/3/1 __Electronic Mail (store and forward, receiver can "pick up" mail whenever desired without constant terminal attention)

6/0/0___Off-line editing

6/0/0 __Type request once (only minor editing required to send unfilled request on to R & L or WILS)

2/2/0___Different request format and numbering system for each system (FV, R & L, WILS)

3/3/0___Compatibility with existing TWX (send and receive)

0/2/3___Compatibility with other data bases
-OCLC
-DIALOG
-Source
-Dow-Jones
-Compuserve

0/3/3 __Flexibility of use--opportunities for applications other than ILL and messaging

1/5/0___Flexibility for different procedures in member libraries

6/0/0___Hard copy output

1/5/0___Statistical record-keeping

0/1/5___Overdue notices/reminders

0/3/3___Assistance with (or automatic) balancing of lending and borrowing among member libraries

6/0/0__ Ease of repair and maintenance

APPENDIX B

NOTES ON SYSTEM SELECTION

Hardware

The hardware specifications are less important in the long term than the availability of software that performs the desired functions. Nonetheless, the following specifications are considered minimal:

- o internal memory of at least 64 Kilobytes. Memory is relatively inexpensive, and many applications software packages require over 50 K of available memory. 64 K is the maximum memory size directly addressable by an 8-bit word length microprocessor.

- o two floppy disk drives for each node installation. Dual drives simplify the copying of files and provide adequate flexibility for the desired system functions. (A single drive is inflexible; more than two drives are unnecessary for the current requirements.)

- o a quality dot matrix printer. Full character printers provide letter quality, but there is a trade-off between the cost (and features) of the processor and software and the cost (and functional features) of the printer. Depending on the vendor's proposal and the amount budgeted, each node might have both a dot matrix printer (for routine loan messages) and a full character printer (for reports and correspondence). Dot matrix printers cost around $500. Full character (daisy wheel or thimble) printers should be available when buying a complete system for as low as $1500, but prices can run as high as $4000, depending on the printer's features.

- o a 1200 baud answer-originate modem. Unfortunately, there is not a single standard, rather (currently) the standards of "Bell" and Racal-Vadic (another manufacturer). This fact becomes important only when additional modems are added to the system, since presumably the vendor will supply identical modems for all nodes. By late summer, D.C. Hayes, a maker of advanced technology modems that have a reputation for being especially reliable and well-designed, expects to have its 1200 baud modem ready for the market. It is expected to be competitively priced and would be a good choice.

- an internal clock that can provide the control signals for the modem, triggering the desired scheduled message transmissions and receptions.

- all necessary cables and connectors. The Network should make it clear in the RFP that it is seeking integrated, turnkey systems, not components that someone in the Network will connect and check out for operation. The vendor should either "bring up" each system--i.e., power it up, check out its operation, and demonstrate it--or provide adequate assistance in the initial operation (e.g., bring up one system as training and provide telephone assistance to each of the other nodes).

Software

Software is the critical component of the system, and the features of the applications software packages probably will be the most important factor in determining the Network's satisfaction with the system. The desired software includes one or more operating systems, several utilities, one or more higher order languages, applications packages (off-the-shelf), and custom software. See further notes below under "Compatibility and Standards".

Operating Systems. The operating system is the software-hardware combination that links the user with the hardware and applications software. Many computer manufacturers have their own operating system; some use CP/M (control program/monitor, sometimes more descriptively known as control program for microcomputers), which has become a de facto industry standard. The operating system choice is important because it determines the range of software which is available. CP/M is a good choice because there are so many packages available and programs can be transferred between machines from different manufacturers. Otherwise, the popular machines and their own operating systems (such as Apple and Radio Shack), represent good choices. (Because there are so many owners of these machines, there is a good "aftermarket" for applications software. Consequently, the choice of software is greater than for other, less popular, machines that also have unique or proprietary operating systems.) On the other hand, the operating system is a significant determinant of the speed with which the system performs, and an operating system that allows the desired functions to be performed rapidly may be a better choice than one which is slow but compatible with a variety of applications packages.

Some machines are compatible with more than one operating system. The TRS-80 Model II, for example, has its own operating system (TRS-DOS) but CP/M also is available. Similarly, the Apple can be expanded with a circuit card that makes it CP/M-compatible. In the latter case, the efficiency (speed of operations) is not as high as in machines that use the Z-80 circuit as the central processor.

Utilities. Utilities are programs that are operating system specific and are used to perform routine tasks such as formatting diskettes, copying files from one diskette to another, communications, etc. The operating system will typically come with several utility programs. The particular communications utilities for Fox Valley may need to be developed especially for the communications requirements of the system.

Higher Order Languages. The purchase should include at least one higher order language (a programming language--one relatively English-like and having a flexible instruction set) so that the Network can develop its own custom software. The best choice probably is BASIC.

Off-the-shelf Applications Software. Applications software represents software that permits the user to perform particular functions very efficiently. The Network purchase probably should include the following applications packages: text processing ("Wordstar", from MicroPro, is a good choice); a calculator, or "spread sheet" type of program (such as SuperCalc, VisiCalc, or CalcStar); and a spelling checking program (such as "The Word" or "SpellGuard"). Database programs would also be useful, but they are undergoing significant changes at present, and it might be better to wait.

Custom Software. Custom software is developed specifically for a defined application. It typically performs that particular function quite well and with considerable efficiency. Custom software is relatively expensive (unless it is self-developed and one does not value one's own time highly) and should be avoided whenever possible. However, in this case, the Network will be transmitting (and receiving) a large number of routine communications, and the communications software should facilitate the creation, transmission, and tracking of these communications. Staff effort should be minimized. Consequently, it is worth defining the functions and formats precisely and requesting the desired software as a part of the purchase.

Compatiblity and Standards

At present, there are few standards in the microcomputer industry. The "S-100 Bus" hardware standard has been adopted as an industry standard, but this is not judged to be of critical importance for the current and immediate Network applications. As noted above, the CP/M operating system has become a de facto standard for the industry because so many microcomputers offer it. Single density eight inch diskettes have a standard data format (the IBM "soft sectored" format). Coupled with CP/M, this assures a machine-to-machine compatibility that does not exist elsewhere in the industry unless the machines are identical (two Apple IIs, for example). This compatibility may be useful to the Network if it wishes to exchange software and files by exchanging diskettes with organizations (e.g., outside the Network) which use other machines.